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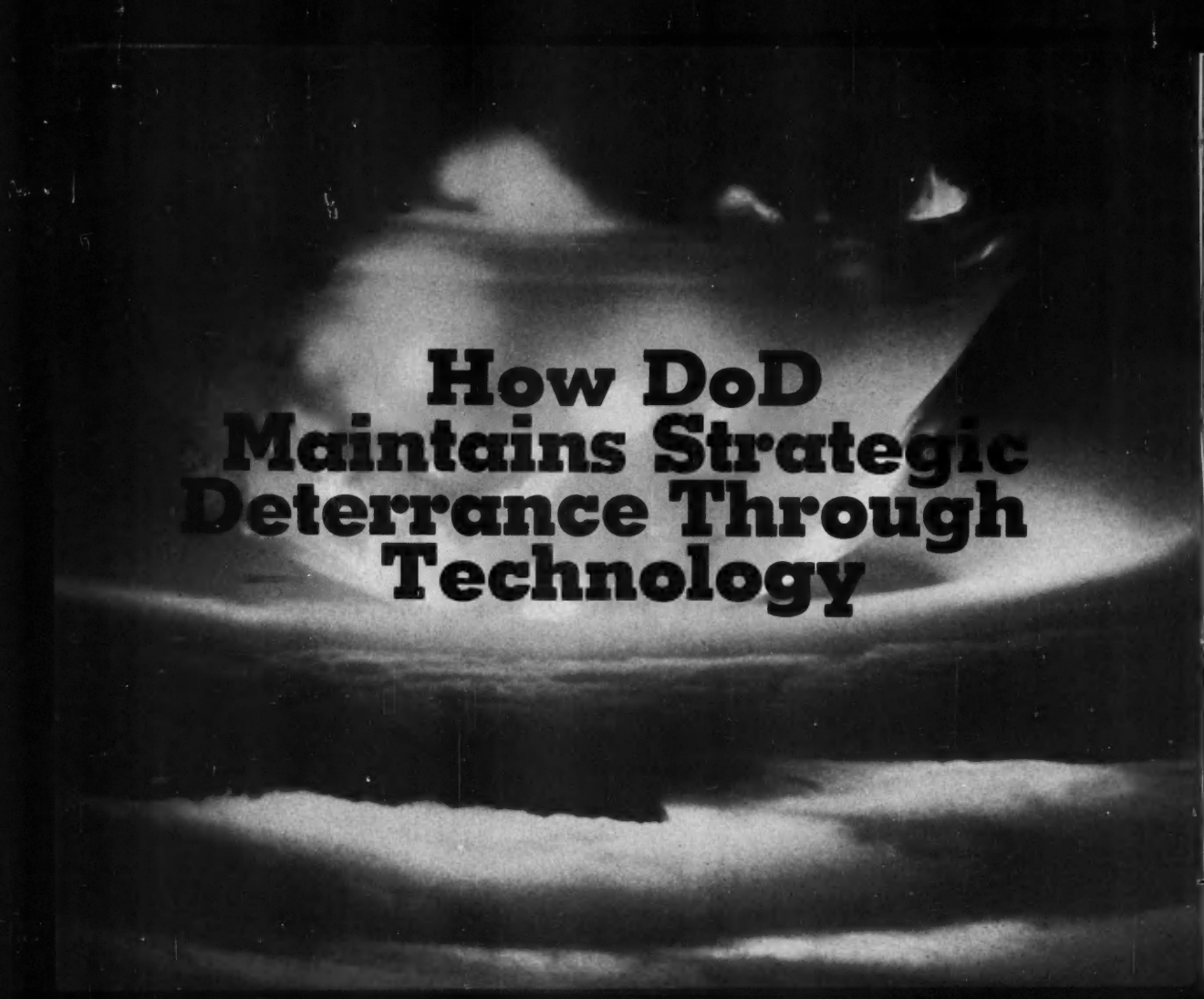
Strategic Deterrance Through Technology


How DoD
Maintains Strategic
Deterrance Through
Technology

The probability of a strategic nuclear attack on the United States is very low. However, the consequences of such an attack would be catastrophic, so the Department of Defense has developed and maintained a powerful strategic force to deter it. Similarly, the Soviets have developed and are maintaining powerful strategic forces of their own.

The result is a condition of essential equivalence—a condition in which:

- Soviet strategic nuclear forces do not become effective instruments of political leverage or coercion;
- Nuclear stability is maintained;
- Advantages in force characteristics enjoyed by the Soviets are offset by U.S. advantages in other characteristics, and
- U.S. strategic forces are not in fact, and are not seen to be inferior in performance to those of the Soviet Union.

We, in the Department of Defense, want mutual deterrence to be so stable that it will not be upset in a crisis. Therefore, it should be so well designed that neither side will be able unilaterally to upset it over the long term. We seek these short and long term stability objectives through a combination of specific, equitable and verifiable arms control agreements, and through unilateral force modernization as required.

Within this framework, I plan to focus my attention on the long term stability of mutual deterrence, and in particular, the role of technology in maintaining the balance. I must emphasize that, whenever possible, we prefer to maintain the current state of affairs through arms control agreements. But we will maintain it by applying the means and resources that are necessary; technology, in my view, is critical to maintaining our options in this environment.

In general, our strategic programs have been characterized by high technology at the initiation of development. Each element of the present *Triad* has driven the cutting edge of technology to reap the benefits of entirely new capabilities and improved performance, flexibility or economy. Once developed, this technology often provided spinoffs in non-defense sectors. For example, the drive for miniaturization in the *Minuteman* and *Polaris* programs spawned the U.S. integrated circuit industry—an industry which now depends upon DoD for only seven percent of its total funding. The commercial impact of the integrated circuit industry is evidenced by the ten-dollar pocket calculator and the digital watch that so many wear today. Similarly, development of the B-47, B-52, and KC-135 fleet had a major impact on the development of the commercial aircraft industry.

A second characteristic of our strategic forces is the extended time frame—typically 10 to 20 years—from initiation of development to end of useful life. For example, about seven years elapsed from the initiation of *Minuteman I* in 1958 until deployment was completed. *Minuteman I* remained operational until late 1974. Development of *Minuteman III* was initiated in 1966, with operational deployment completed in 1975. The projected *Minuteman III* lifetime could be 10 years or more. The *Poseidon* Submarine Launched Ballistic Missile (SLBM) began development in 1965 and will be completely deployed with completion of *Polaris* conversion this year. The development of the B-52 was initiated in the late 1940s, with the first aircraft delivered to the Strategic Air Command in 1955. Production of the latest models continued until the early 1960s, and our present B-52 force ranges in age from 16 to 20 years.

Two characteristics, high technology and an extended development and operational lifetime, bring different factors to bear in considering employment and acquisition strategies for our strategic forces. Employment strategy deals with the application of forces in being. Acquisition strategy deals with application of the U.S. industrial base to sustain mutual deterrence at some point which could be 10 or 20 years into the future.

An effective development and acquisition strategy must appropriately hedge against the uncertainty in the operating environment of our forces over this extended time period. One such means of hedging is to develop forces which, in the aggregate, are relatively insensitive to the few possibly significant Soviet breakthroughs. The present *Triad* provides such a capability. For example, a breakthrough in Soviet Anti-Submarine Warfare (ASW) technology would have little impact on the *ICBM* or airbreathing legs of the *Triad*. Another means of hedging is to sustain a critical technology base which can improve our response to breakthroughs in the threat. This approach recognizes the historical dependence of strategic forces on high technology, and provides a reservoir of technology to maintain future options. A third approach extends hedging of the threat to account specifically for potential future breakouts from

By Dr. William J. Perry
Under Secretary of Defense
(Research and Engineering)

DEFENSE news briefs

Fourth Consecutive NATO Maneuvers Set

For the fourth consecutive year, NATO will hold a series of multinational exercises September through November that stress commonality and interoperability.

Called **Autumn Forge,** the first of the series starts Sept. 6 with **Reforger** and **Crested Cap,** two American exercises to test aerial and sealift deployment from the States to the Federal Republic of Germany.

The United Kingdom, Belgium and the Netherlands and other NATO countries will participate in **Bold Guard** in Denmark and Schleswig-Holstein, plus **Gryphons Galore, Red-Tornado,** and **Saxon Drive** in central Europe.

NATO will stage this fall 30 field training and command post exercises, as ground, sea and air units from Norway to the Mediterranean stage defensive maneuvers.

The **Autumn Forge** series ends in November with **Able Archer,** a command post exercise for all NATO units.

New Stateside Sub Base Will Be Refit Site

Army has transferred its former Military Ocean Terminal at Kings Bay, Ga., to the Navy for development as a Naval Submarine Support Base.

The new base is being developed as the refit site for Submarine Squadron Sixteen, which must withdraw from its existing base of operations at Rota, Spain, by July 1, 1979.

Army Names Clarke First Woman 2-Star

The Army has named its first woman to two-star rank. She is Brig. Gen. Mary E. Clarke, commanding general of the U.S. Army Military Police School and Training Center and Ft. McClellan, Ala.

Former director of the now-defunct Women's Army Corps (WAC), General Clarke was 12th on a list of 27 general officers the President forwarded to the Senate for confirmation as temporary major general.

The Air Force already has had its first woman major general—Maj. Gen. Jean Holm, now retired.

All Navy flag officers—including women—wear the two stars of rear admiral, even though they may be in the "lower half" or one-star pay grade.

Sweden to Buy Harpoon Missiles

The Department of Defense has notified appropriate Congressional Committees of a proposed Letter of Offer to sell the Government of Sweden 100 **Harpoon** missiles and 12 shipboard canister launch systems and support, and **Harpoon** weapons maintenance station at an estimated value of $94.2 million.

The Department of the Navy would have primary responsibility for transactions related to this offer.

The Joint Chiefs of Staff pose for their first official portrait. Left to right, they are: Adm. Thomas B. Hayward, new Chief of Naval Operations; Gen. Bernard W. Rogers, Army Chief of Staff; Air Force Gen. David C. Jones, new Chairman, Joint Chiefs of Staff; Gen. Lew Allen Jr., new Air Force Chief of Staff; and Gen. Louis H. Wilson Jr., Commandant, Marine Corps.

existing treaties.

Each type of hedging has been considered in the framework of our present strategic programs. To examine the role of technology in this framework, we will look at each *Triad* element in turn, starting with the existing forces, considering the actions which the Soviets could take to blunt their effectiveness, and noting how our various technology and development programs are structured in response.

Our deployed *ICBM* forces include 1,054 operational *ICBMs*—1,000 *Minuteman (II & III)* and 54 *Titan II*. The combination of yield, accuracy and timely response provided by this *ICBM* force allows it to be effective against the full range of Soviet targets. Soviet actions to blunt the effectiveness of our *ICBM* force can be lumped into three categories:

- passive protection;
- active defense, and
- pre-emptive attack.

Soviet actions in passive defense include construction of new *ICBM* silos—the *SS–17, 18* and *19*—with hardness similar to the hardest U.S. silos. The Soviets have also implemented a civil defense program to increase industrial hardening, provide shelters for key personnel and encourage dispersal of population from urban centers. While these civil defense actions are probably of limited effectiveness, they may improve the Soviet perception of surviving an attack. U.S. responses to these actions are based upon technology developed in the early 1970s. They include improving the accuracy of the *Minuteman III* force, completing the development of the new, higher yield *MK–12A* reentry vehicle, and deploying it on a portion of the *Minuteman III* force.

Soviet actions in active defense could involve development and deployment of a new Anti-Ballistic Missile (ABM) system. The Soviets have been conducting research and development on a new *ABM* system, including an interceptor and associated radars. Although limited today by the *ABM* treaty, a crash Soviet development and deployment program could provide many operational *ABM* sites by the early 1980s.

An effective U.S. response to such a deployment could be based on the technology provided by the Advanced Ballistic Reentry Systems (ABRES) program. The *ABRES* program provides a base of reentry and penetration technology which reduces the lead time for reaction to a Soviet *ABM* deployment. Existing technology provides for penetration aids to confuse and saturate defenses, and for deployment of a maneuvering reentry vehicle which could maintain accuracy while evading an *ABM*. The ongoing *ABRES* technology program is intended to maintain our existing edge in reentry and penetration technology, and provide similar options for future systems.

The third category of potential Soviet actions against our *ICBM* force is pre-emptive attack—attacking our *ICBMs* in their silos. When they complete deployment of their fourth generation *ICBMs*, the Soviets should have several thousand reentry vehicles. They could

A worms-eye view of a Minuteman guided missile in a silo prior to launch.

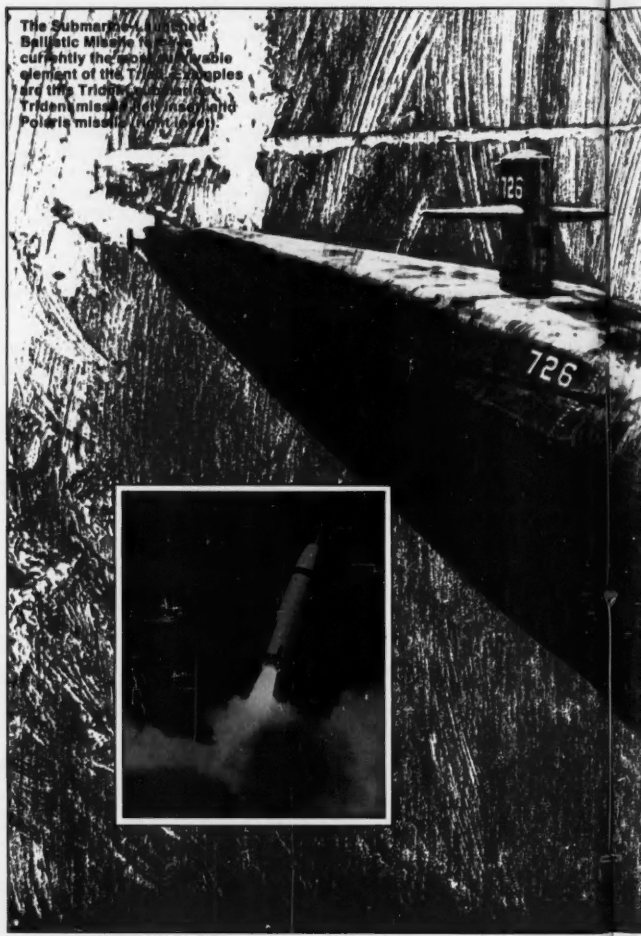
target two reentry vehicles against each of our 1,054 *ICBM* silos, and still retain the majority of their reentry vehicles for other purposes.

The effectiveness of a Soviet two-on-one attack on our *ICBMs* depends upon a number of factors. The most critical factor, though, is the accuracy of the Soviet *ICBMs*. The Soviets are closing the gap in *ICBM* accuracy, and when Soviet accuracy approaches the present U.S. accuracy, our *ICBM* force will be seriously threatened. While there is great room for uncertainty in our calculations and estimates, I believe our *ICBM* force could be seriously threatened by a Soviet two-on-one attack by the early to mid-1980s. In addition, the Soviets have in development a fifth generation of *ICBMs* which could eventually make things even worse.

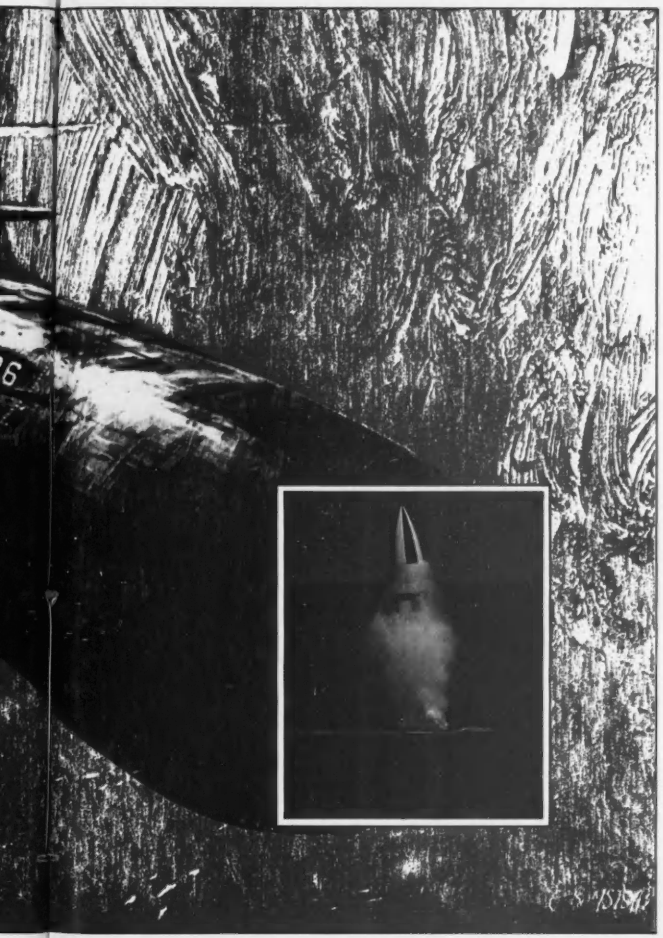
We have available several responses to the possibility of an effective pre-emptive attack on our *ICBM* force. These include a program called *Missile-X* or *MX*, active defense of our *ICBM* silos, and a launch under attack strategy.

The *MX* program includes both a missile and a basing scheme designed to improve survivability. In principle, the basing scheme can be separated from the missile, although there are some important considerations which link the two. These include specifications for the environment that the missile itself must withstand and the required survivability of a given missile, which is influenced by the number of reentry vehicles per missile. In general, a large number of reentry vehicles per missile (e.g., 8–10) can offset some basing vulnerability in terms of the total number of reentry vehicles expected to survive. However, if we are to maintain an environment of stability, then the accuracy and number of *MX* missiles developed must be considered in light of the potential counterforce capability which they represent.

At this point, we feel our technology base is sufficient to proceed with confidence in the development of a new missile. But this is not the case for the associated basing approach. The intent of a new basing approach is to restore the stability threatened by increases in both the number and accuracy of Soviet reentry vehicles. We are working on *MX* basing schemes which remove the incentive for a pre-emptive strike by requiring many reentry vehicles to successfully attack a missile. So-called Multiple Aimpoint or *MAP* approaches are designed to provide many credible aimpoints for each *ICBM*, requiring the opponent to attack every aimpoint to insure destruction. *MAP* approaches considered include underground trenches with several geometric configurations. The *ICBM* may be moved to various locations in the trench, requiring that several reentry vehicles be targeted against the trench to



The Submarine-Launched Ballistic Missile force currently the most survivable element of the Triad. Examples are the Trident missile and its predecessor, Polaris missile (inset).



be effective. Also considered are multiple shelters which provide several "shells" to cover a missile as in the old pea and shell game. We have not yet developed sufficient confidence in the cost or survivability of any particular approach to recommend full scale development. We are continuing to evaluate competing approaches on a high priority basis, with the intent of making a recommendation late this summer.

Another response to a pre-emptive attack is to defend our silos with an *ABM* system. This option is presently constrained by the *ABM* treaty, which would limit the defensive system to 100 interceptors. We do, however, maintain a technological edge in this capability through our Ballistic Missile Defense (BMD) program. The technological base resulting from this program could provide, if required, an alternative for maintaining the survivability of our *ICBM* force.

Yet another response to a pre-emptive attack is a launch under attack strategy, in which we launch our *ICBM* force when we ascertain it is under attack. We are undertaking to improve our early warning sensors and our ability to correlate warning information to characterize such an attack. The problem with a launch under attack strategy is that it establishes a hair-trigger approach to launching our *ICBM* forces—an approach which can greatly undermine stability. For this reason, I would not recommend relying on launch under attack as an exclusive response. But I do advocate retaining the capability to launch under attack to provide flexibility and enhance deterrence in combination with other responses.

The inventory of fleet ballistic missiles includes 656 *Polaris* and *Poseidon SLBMs*. The *SLBM* force is currently the most survivable element of the *Triad*. The Soviet threat to this force can be lumped into the same three categories discussed earlier:

- passive protection;
- active defense, and
- pre-emptive attack.

Soviet actions in passive protection and active defense are the same actions described earlier in discussing our *ICBM* force. In response to passive protection, on-going programs such as the *Trident I SLBM* will provide improved accuracy and reentry vehicle performance. Our Improved Accuracy Program will validate the performance of current *SLBM* systems and determine the extent to which *SLBM* accuracy can be improved. *Trident II*, a potential future *SLBM* with increased payload and accuracy offers the capability to be effective against the full range of Soviet targets in the presence of passive defense.

In response to Soviet active defense with a deployed *ABM* system, our *SLBM* forces can rely on options provided by the *ABRES* program. The *Mark 500*

Evader reentry vehicle concept has already been successfully demonstrated in flight tests of *Trident I* missiles. The option to place this reentry vehicle in engineering development will be maintained to counter potential Soviet initiatives in *ABM* development.

The remaining category of Soviet actions against our *SLBM* force is pre-emptive attack—attacking the submarine launch platforms. The Soviets have underway a broad-based research and development program to detect submarines. A variety of sensors are being investigated, including magnetic and acoustic sensors. Despite this activity, we believe the U.S. *SLBM* force is secure today and will remain secure for some time. But we are hedging against Soviet breakthroughs by proceeding with production of the *Trident* submarine and the *Trident I SLBM*. The *Trident* submarine will operate with reduced noise, making detection more difficult. The increased range of the *Trident I SLBM*—7400 kilometers—will provide further protection by increasing the operating area for *Poseidon* and *Trident* submarines. The *Trident II SLBM* could further enhance survivability by

The deployed force of Air Force FB-111s and B-52s (inset) includes more than 300 aircraft, some of which are equipped with Short Range Attack Missiles (SRAM).

providing an even greater operating range. We are continuing to develop the Extremely Low Frequency (ELF) shore to submarine communications system which can alert the *SLBM* force in a manner that will significantly reduce the opportunities for detection. We are also continuing a broad interdisciplinary program to investigate submarine detection techniques under operational conditions. This program provides a hedge against Soviet breakthroughs and provides for development of counter-measures as required.

The deployed force of *B–52s* and *FB–111s* includes more than 300 aircraft, some of which are equipped with the Short Range Attack Missile (SRAM). This is the only recallable element of the *Triad*. Soviet actions to blunt the effectiveness of this force can again be lumped into the categories of passive defense, active defense and pre-emptive attack. One response to Soviet passive defense is our plan to improve the *B-52* bombing and navigation system to improve delivery accuracy. We are also developing the Electronically Agile Radar (EAR) which could further improve accuracy and provide resistance to jamming. In addition, we plan to increase the number of available warheads as we develop and deploy several thousand Air Launched Cruise Missiles.

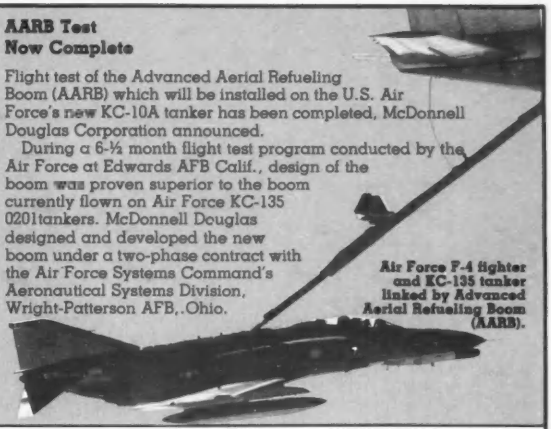
Soviet actions in active defense would include attacking our bombers and cruise missiles in the air. The Soviets are continuing to develop a new surface to air missile system, the *SA-X-10*, which could be used against low altitude penetrating targets. We estimate that the system is not yet operational (as indicated by the *"X"* in the *SA-X-10*), but believe it could be widely deployed by the mid- to late-1980s. To be effective against a large force of small, low altitude targets like the cruise missile, the Soviets would need to deploy 500–1,000 *SA-X-10* systems—a massive investment. The Soviets are also working on look-down/shoot-down technology which could permit them to engage low altitude bombers and cruise missiles that would normally be lost in the radar ground clutter. While Soviet technology is considerably behind U.S. technology in this area, we can expect a large scale deployed capability by the late 1980s. To be effective in using a look-down/shoot-down capability, the Soviets would need some means of vectoring fighters to their targets. This could be accomplished with a system like the U.S. *AWACS*, and we believe the Soviets are proceeding to develop such a capability.

There are several U.S. responses underway to counter these Soviet initiatives in active defense. We are evaluating improvements to present electronic countermeasures

AARB Test Now Complete

Flight test of the Advanced Aerial Refueling Boom (AARB) which will be installed on the U.S. Air Force's new KC-10A tanker has been completed, McDonnell Douglas Corporation announced.

During a 6-½ month flight test program conducted by the Air Force at Edwards AFB Calif., design of the boom was proven superior to the boom currently flown on Air Force KC-135 0201tankers. McDonnell Douglas designed and developed the new boom under a two-phase contract with the Air Force Systems Command's Aeronautical Systems Division, Wright-Patterson AFB,.Ohio.



Air Force F-4 fighter and KC-135 tanker linked by Advanced Aerial Refueling Boom (AARB).

dateline: R&D

TV Best System For Ship Safety

Navy tests, at the Naval Ocean Systems Center, San Diego, Calif., indicate that active low-level television is the most promising viewing system for avoiding floating hazards such as logs, reefs, or even whales which pose problems to fast ships like hydrofoils.

In the past, the more successful systems have used laser illuminators with complex gatting networks. However, the less successful systems used continuous wave illuminators without gatting.

The Navy now is experimenting with a new geometry that has the illuminator mounted as low as possible and the camera as high as possible but not aimed to cover the same field of view.

This concept already has been tested aboard the **USS Pegasus**, the first of the new class of patrol missile hydrofoils. Tests indicate high contrasts between floating targets and the sea.

Navy is looking for more improvements, however; for example, a possible servo loop between the camera and the ship's helm so that when the ship turns the camera turns to follow the path the ship will travel.

An E-3A AWACS aircraft approaches KC-135 tanker for an aerial refueling.

systems in the *B-52* and *FB-111*. These actions would improve protection against both surface-to-air missiles and look-down/shoot-down fighters. We are in the process of providing a truly major weapons enhancement as we introduce the Air Launched Cruise Missile. The first generation cruise missile currently under development will provide a radar cross section or radar signature which is orders of magnitude below that of the *B-52*. Second generation cruise missiles offer even greater potential for reducing the radar signature, making the cruise missile very difficult to detect. In addition, the unmanned cruise missile can afford to risk flight at very low altitudes, where ground clutter makes detection even harder. Finally, a force of several thousand cruise missiles provides great offensive flexibility—flexibility which can be used to concentrate and saturate defenses, making the task of defense planning very difficult. We are considering wide body cruise missile carrier aircraft which could substantially increase the number of cruise missiles in the future air-breathing force.

The remaining class of Soviet actions against the air-breathing force is pre-emptive attack—attacking the bombers before they can depart their bases. U.S. responses to this action include bomber dispersal and improved warning for launch under

attack. Launch under attack does not present a hair-trigger problem with our air-breathing forces, since they can be launched from under attack and be recalled if the attack does not materialize. The actions to improve our warning and attack assessment capability are the actions discussed earlier in terms of protecting our *ICBM* force from a pre-emptive attack. We plan to expand our on-going programs to better characterize the nature of an attack and improve warning time.

The submunitions can be seen prior to deploying parachutes and slowly descending to impact with the target area.

SUMMARY

The present *Triad* of strategic forces provides an effective deterrent today. The combination of three individually effective elements greatly complicates any Soviet plan to blunt effectiveness, and hedges against a Soviet breakthrough against any single element. For the future, we are also hedging by supporting each *Triad* element with effective options for improvement and by providing a broad supporting technology base.

Our *ICBM* force is presently well-hedged against Soviet actions in passive and active defense. But there is a growing vulnerability to pre-emptive attack which could seriously threaten the force by the early to mid-1980s. We have a number of options in response, and are actively considering alternatives, with the intent of providing recommendations by late summer.

Our *SLBM* force appears well-hedged against all three categories of Soviet actions to blunt effectiveness. But to continue our hedge against Soviet breakthroughs, we will maintain the option to improve the range and payload of the *SLBM* force, and vigorously pursue a submarine security program.

Our air-breathing force of penetrating bombers and cruise missiles provides a combination which should be effective until at least the mid-1980s. We will continue to assess Soviet efforts in active defense, and adjust the development of follow-on cruise missile technology to react appropriately. We also plan to consider a new penetrating bomber and a cruise missile carrier aircraft, seeking a sound technological building base which can provide a fundamental advantage in the long-term action-reaction environment.

We believe that a stable environment of mutual deterrence can be maintained at substantially lower strategic force levels than are deployed by both sides today. We will continue to seek arms control agreements which will permit such a reduction in an equitable and verifiable manner. In the absence of productive agreements, we will, of course, pursue all actions necessary to maintain our security.

But—even with an equitable and verifiable agreement, we will continue our technological hedges to sustain the conditions of deterrence in the long term. Prudent hedging must consider possible treaty breakouts, as well as force improvements and breakthroughs in Soviet capabilities. In this future environment, I believe technology will play a vital and growing role.

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COVER: A Minuteman missile launches at the sunset

Reassignments

Dr. James Paul Wade Jr., assistant for analysis, Office of the Under Secretary of Defense, Research and Engineering, was picked to be chairman of the Military Liaison Committee to the Department of Energy, and assistant to the Secretary of Defense for Atomic Energy.

Gen. Frederick J. Kroesen, commanding general for the U.S. Army Forces Command, has been named to become Vice Chief of Staff, U.S. Army.

VAdm. Alfred J. Whittle Jr., Deputy Chief of Naval Operations (Logistics) goes to Chief of Naval Material. He also was nominated for promotion to admiral.

Lt. Gen. Robert M. Shoemaker, deputy commanding general, U.S. Army Forces Command, will be commanding general, U.S. Army Forces Command. He also has been picked for promotion to general.

VAdm. Thomas J. Bigley, deputy commander-in-chief and chief of staff, U.S. Pacific Fleet, will become deputy chief of Naval Operations (Logistics).

VAdm. Robert B. Baldwin, Seventh Fleet commander, has been selected to be Deputy Chief of Naval Operations (Manpower) and Chief of Naval Personnel.

Maj. Gen. Kenneth McLennan, 2nd Marine Division commanding general, became deputy chief of staff for manpower, Marine Corps Headquarters, recently. He also was selected for promotion to lieutenant general.

Maj. Gen. Hans H. Driessnack, budget director in the Air Force Office of the Comptroller, has been named to become the comptroller of the Air Force. He also has been nominated for promotion to lieutenant general.

RAdm. Carlisle A. H. Trost, Systems Analysis Division director, Office of the Chief of Naval Operations, was named to be deputy commander-in-chief and chief of staff, U.S. Pacific Fleet. He also was picked for promotion to vice admiral.

Maj. Gen. John A. Wickham Jr., assistant deputy chief of staff for Operations and Plans, U.S. Army, goes to director, the Joint Staff, Organization of the Joint Chiefs of Staff. He also was nominated for promotion to lieutenant general.

Reappointment

Maj. Gen. La Vern E. Weber, Army National Guard, was nominated for another four year term as Chief, National Guard Bureau effective Aug. 16, 1978.

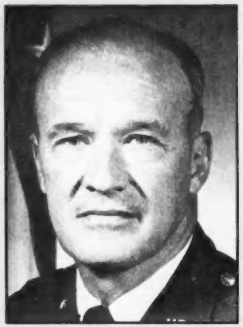
Retirement

Maj. Gen. Guy E. Hairston, Jr., USAF, Assistant Secretary of Defense for Public Affairs, was nominated for retirement in his current grade effective August 1, 1978.

VAdm. Parker B. Armstrong, Research, Development, Test and Evaluation director, Office of the Chief of Naval Operations, was named to be retired in his current grade.

Lt. Gen. John P. Flynn, Air Force inspector general, was nominated for retirement in his current grade effective Oct. 1, 1978.

VAdm. Bigley



Maj. Gen. Hairston

Maj. Gen. Weber

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